DOCUMENT RESUME

ED 204 540 CE 029 439

AUTHOR Sullivan, Dennis J.
TITLE Improving Productivity in the Work Force: Implications for Research and Development in Vocational Education. Occasional Paper No. 72.
INSTITUTION Ohio State Univ., Columbus. National Center for Research in Vocational Education.
PUB DATE Jun 81
NOTE 38p.: Paper presented at the National Center for Research in Vocational Education Staff Development Seminar (Columbus, OH, 1981).
AVAILABLE FROM National Center Publications, The National Center for Research in Vocational Education, The Ohio State University, 1960 Kenny Rd., Columbus, OH 43210 (OC 72, $2.35).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Business Administration; Definitions; *Economic Factors; *Educational Research; Employee Attitudes; History; Human Capital; Inflation (Economics); Investment; *Organizational Effectiveness; *Productivity; Program Development; Research and Development Centers; *Vocational Education

ABSTRACT

Declining productivity is a major problem in the American economy. Gains in productivity, and finally, actual rates of productivity, have been declining since the late 1960s. Specific problems arising as a result of this decline in productivity are the inflationary pressures that we face as a nation, the increased regulatory environment under which we must live, and the growth in the size of the public sector that has been associated with the growth in regulatory activity. Some reasons for the decline of productivity in the United States include reduced investment, larger service sector, government regulations, environmental expenditures, labor restrictions, and work disincentives. Unless productivity improves in the U.S. in this decade, we will all suffer a decline in our standard of living. There are certain challenges that need to be considered in addressing productivity: definition and measurement, politics, planning and behavior--"What's in it for me?" Unless an organization or a nation can answer that final challenge, productivity is not going to improve. Improvement pf productivity in any organization requires a structured productivity program. One recommended program has ten elements: awareness and acceptance, organization, goals, resource effectiveness, employee involvement, incentives and gain sharing, rewards and recognition, training, measurement, and leadership. This program can bring improvements in productivity. (KC)

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Occasional Paper No. 72

IMPROVING PRODUCTIVITY IN THE WORK FORCE:

IMPLICATIONS FOR RESEARCH AND DEVELOPMENT IN VOCATIONAL EDUCATION

by

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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June 1981

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FOREWORD

The purpose of the National Center for Research in Vocational Education's Occasional Paper Series is to present distinguished lecturers speaking on topics of interest to the vocational community. It is hoped that this series will persistently challenge and stimulate the university, its colleges, departments, the National Center, and the educational community to the ends that goals will be clarified, priorities will be more appropriately ordered, methods will be more effective, and human lives will be enriched.

Dennis J. Sullivan, Vice-President for Government Services at the American Productivity Center in Houston, Texas, has been selected by the National Center and The Ohio State University to speak on productivity, which is a topic of concern to business, labor, government, and education. Mr. Sullivan points out that the national decline in productivity cannot be blamed on any one segment of the population. He goes on to say that there has been no strong government policy to combat the problem.

What can industries and organizations do to increase productivity? According to Mr. Sullivan, the only solution is to develop a plan. In this presentation, he offers suggestions for structuring such a plan.

Mr. Sullivan is in charge of the American Productivity Center's activities related to productivity improvement, management, and measurement in public sector organizations. The author of numerous papers on training and development, Mr. Sullivan previously served as a consultant specializing in performance assessment and training system development for government and private organizations in this country and abroad.

It is with great pleasure that The Ohio State University and the National Center for Research in Vocational Education welcome Dennis J. Sullivan, to share his presentation "Improving Productivity in the Work Force: Implications for Research and Development in Vocational Education."

Robert E. Taylor
Executive Director
The National Center for Research
in Vocational Education

IMPROVING PRODUCTIVITY IN THE WORK FORCE: IMPLICATIONS FOR RESEARCH AND DEVELOPMENT IN VOCATIONAL EDUCATION

Introduction

I would like to take a couple of moments to talk about the American Productivity Center and why this organization with which I am affiliated was created, as this relates directly to my presentation. Our Center is a privately funded, nonprofit organization that was created because there was a concern, on the part of our founder, Dr. Grayson, and on the part of the American business community, that productivity in the United States was in trouble. It was believed that if we could improve productivity, we could have an impact on some of the major economic problems we face as a nation and as individuals. The private business community in the United States felt strongly enough about these issues that one hundred organizations put up the money to establish the Center. Since that time our developmental efforts have resulted in the addition of another 120 organizations and foundations to our founder and sponsor base. These organizations contribute to and support the Center because they believe in the objectives around which we are established. These objectives are (1) there needs to be stronger awareness of the importance of productivity and its role in the American economy; and (2) there is a productivity problem in this country, and there are solutions to that problem. Somehow this message needs to be brought out, discussed, and clarified. There is a tremendous need to understand clearly the particular ramifications that productivity holds for specific segments of the economy.

There is a third objective of my organization. It relates to productivity, productivity measurement, and productivity improvement, about which we do not have sufficiant information, and to which we must address ourselves in a research and development model. Research and development in these areas would allow us to identify the improvements in productivity that are necessary and the techniques appropriate for causing those improvements. So, as an organization, we have a research responsibility. We are extremely concerned that our research and awareness efforts be translated into action. Another concern is that individual organizations take the initiative in addressing themselves to improving productivity internally. Productivity cannot be mandated from the White House; it cannot be mandated by Congress. The improvements in productivity that are necessary for the economic well-being of this country must come from individual organizations in both the private and public sectors. So the third objective of the American Productivity Center is a commitment to work with individual organizations, addressing the peculiar problems they have with their productivity, and encouraging and assisting them in taking steps to improve it.

The Productivity Problem

At the present time in the United States, we have a rate of inflation that is running in excess of 15 percent for this year, and if nothing is done, it will probably go higher. We are either in the midst of a long predicted recession, or it is going to arrive next week, depending on which newspaper column you read. I think it is here! I think it is real! I think it is beginning to hurt! Unemployment is up to the highest level it has been in fifteen years. That is having an impact on the people we would least like to have unemployed in terms of our social goals as a nation. Because of the combination of unemployment and inflation, we are all feeling the effects of lower real income. Social

tensions are increasing and will continue to increase as the economic pie available in this country shrinks and special interest groups continue to demand their "fair share"—however they choose to define it. We see a disturbing trend in the drift away from the private enterprise system in this country.

Productivity can be defined in a variety of ways, and it has a variety of components. I am not going to try to start my presentation with a precise definition of productivity. I would rather let that evolve as I go along. Productivity, at this point in time, is a problem. It is a problem for the nation; it is a problem for people who are involved in vocational education. Productivity poses a challenge to this nation. It poses a challenge to you, as specialists, in a particularly important area. Finally, productivity represents an opportunity. I would like to talk about those three points today.

The reason we have a problem is that the productivity growth rate in the United States is slowing down. This is not just a natural low point in the economic cycle; it is a worldwide phenomenon. Productivity growth is slowing down in every country in the world. Unfortunately, in our country it happens to be slowing down faster than in the rest of the world. This decline in productivity growth has put the United States in a very uncompetitive position in particular industries. As we continue to become less productive, to underdevelop as a nation, competition from abroad is going to increase. The cost of doing business and the cost of maintaining a work force is increasing every year.

Unfortunately, output is declining at the same time, which fosters that noncompetitive situation. We see some real problems in the proliferation of the government regulations that deal with the operation of businesses and the operation of public sector operations and functions. Generally speaking, government entities are more drastically affected by the proliferation of government regulations in the areas of environmental protection, health, and safety than are private sector organizations. Therefore, productivity in public sector organizations suffers even more. The general lack of productivity awareness, in part, contributes to this as well. The combination of all of these factors, feeding upon one another, has led to the continued decline in our nation's productivity rate.

There are several viewpoints on productivity and the productivity problem that are in contention at this time in this country. One is that there is a measurement problem: "We don't have a productivity problem; what we have is a measurement system that cannot accurately assess the economic health of the United States." Unfortunately, the good, bad, or indifferent measurement system that we have is the same one used by other developed nations in the world. This measurement system indicates we have a serious problem because the productivity in these other nations is growing, and ours is not. So it seems somewhat erroneous to focus on the measurement contention as the sole reason for our productivity problem.

A second point of view is that productivity is not a root cause of our economic problems. It is an artifact of those problems. Many people believe that if we can resolve problems such as inflation, if we can resolve problems such as the balance of payments, productivity will take care of itself. In my Center's view, that is putting the cart before the horse.

The third point of view is that there are real productivity problems that exist in this country and that they can and should be addressed. That is, in fact, why the Center was created.

The last viewpoint is the one to which my organization subscribes; it is that we have all three of those problems. We have economic problems that we have to resolve; productivity is one of the keys to resolving inflation, as well as being one of the keys to addressing our balance of payments problems. We do have measurement problems, and we do need to develop tools that allow us to

more accurately measure the productivity of service sector operations such as research; but our perspective is that the way to do these things is to address the productivity problem as a whole and then treat the other variables as subsets of it rather than excuses for it.

From the end of World War II in 1945-46, up until 1967, productivity in the United States grew at a rate of 3.3 percent a year, every year. It was a constant; we could count on it; it was a fairly reasonable growth rate for the United States. It led to some substantial and positive changes in our economy. Then something happened to the economy in the United States in 1967 or 1968. The productivity growth rate in this country from 1967 to 1978 averaged about 2.2 percent a year. It dropped substantially below that level during the recession in 1974-75, but it averaged 2.2 percent a year. In 1978 it declined to 1.8 percent and in 1979 it went to a negative 1.9 percent (see figure 1). This was the first time productivity growth in the United States had been negative since the Great Depression in the 1930s. As I indicated earlier, we are not alone in having a productivity growth rate decline. This has been a worldwide phenomenon. Every developed nation in the world has experienced a decline in the rate of productivity growth. Unfortunately, ours has been much more severe than that of any other developed country. When I make this statement, I am speaking in terms of the specific industries in the United States. That is the measure of the Gross National Product over the input of person-hours of labor in a particular time period. It is not as accurate a measure as we would like to have, nor is it precise enough for the kinds of management decisions that are necessary for this nation, for an industry, or for an individual organization; but it is the method of measurement that is presently used for a variety of historic reasons. So, keep in mind that I am talking about that particular measure when I discuss productivity and productivity growth.

I indicated that productivity has declined in the United States. That decline is not universal. We have segments of the economy that are extremely healthy, that experience a positive 6 percent growth rate; some experience a 7 percent growth rate each and every year (see figure 2). These segments tend to be in areas that are capital intensive or highly technological in orientation. The telecommunications industry, the synthetic fiber industry, and air transportation are examples. The segments that experience a lack of growth are labor intensive types of operations. Coal mining happens to be among the worst in this category, followed very closely by construction, followed by retail trade.

However, if you synthesize all of the sectors of the economy that we measure at the present time, the average productivity growth rate last year was negative. These same segments of the economy are measured in other countries, and compared to the developed nations of the world, the productivity growth rate in the United States is dead last! The rate of productivity growth among the developed nations of the world surpasses us in ten countries out of the top eleven. We rank eleventh at the present time. The countries that surpass us include France and Italy, as well as the known and acknowledged leaders—Japan and West Germany.

In terms of absolute productivity, the United States is still the most productive nation in the world. Unfortunately, at the rate of productivity growth that is being experienced in this country, and in light of what is predicted for this country for the next ten years, we will soon lost first place among developed nations in absolute productivity. If the other developed nations of the world continue to grow at the rate we have predicted for them, a rate that they have exceeded for the last two years, we may become the fifth most productive country, if not the sixth, within this decade.

In economic terms, we are going to become a fourth or fifth ranking world power within this decade unless something positive is done to change that situation. The impact of the decline in productivity growth is significant and direct. If productivity had continued to grow at the rate it grew prior to 1967, your family income would have been $3,700 higher in 1978 (see figure 3); it would

U.S. PRODUCTIVITY

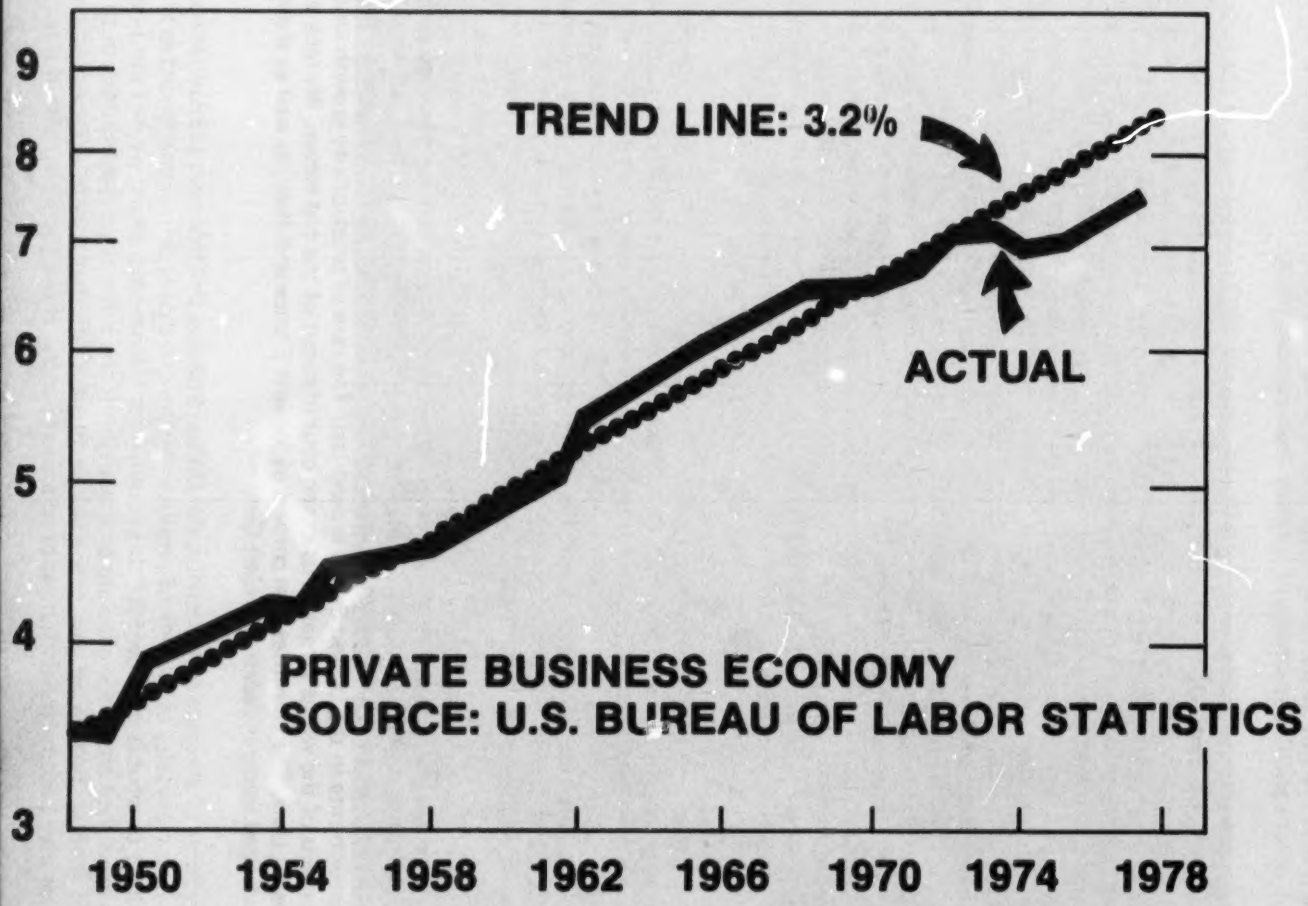


FIGURE 1

OUTPUT PER MAN-HOUR—MFG.
1967-77

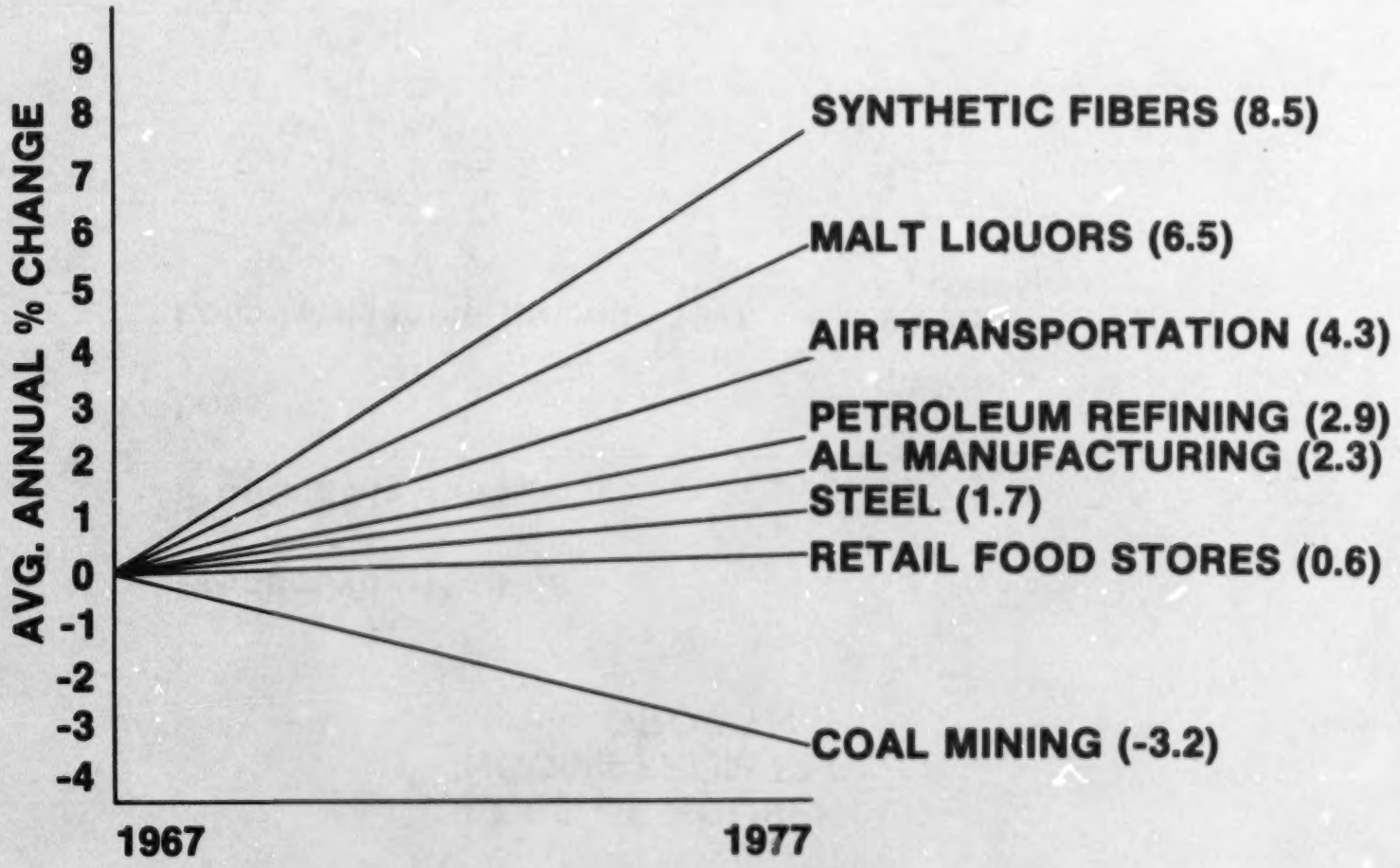


FIGURE 2

LOSS OF HOUSEHOLD INCOME FROM SLOWER GROWTH

Productivity 1948-68	3.3%
Productivity 1968-78	1.5%
Loss	1.8%
Loss Household Income: 1978	$3,700

FIGURE 3

Source: New York Stock Exchange

have been $4,200 higher in 1979. We would have had an increase in income of 20 percent or more, and we would have had a Gross National Product of almost $300 billion more than we did.

Unfortunately, we did not have that growth rate, so all of these figures show up as negatives in that time frame. In very specific terms, if we look at the rate of productivity growth from 1948 to 1968, it was 3.3 percent. Subtract the 1.5 percent we grew between 1968 and 1978 from that 3.3, and that leaves us with a residual of 1.8 percent. That translates into $3,700 of lost income to the average family in 1978. In terms of the impact on individual businesses, take a look at the growth in compensation (see figure 4). It has grown. Look at the rate of output—it has declined. That is where the problem lies. We are paying more and getting less. In terms of its impact on individuals, if you will look at real hourly compensation that is adjusted for the effects of inflation, people are no better off as a result. I think some figures I saw last week indicated that as a result of inflation, the average compensation in this country is now basically at the same level as it was in the second quarter of 1972. There has been no real progress in terms of compensation in this country.

Specific problems arising as a result of this decline in productivity are the inflationary pressures that we face as a nation, the increased regulatory environment under which we must live, and the growth in the size of the public sector that has been associated with the growth in regulatory activity. The interesting thing to look at in this respect is that the data indicate the correlation between the size of the public sector and the decline in productivity is a negative .9 (see figure 5). The larger the public sector grows, the slower productivity grows in our nation. The private sector threat that I mentioned, the social demands of which I have already spoken, and the continued slowdown are all part of a spiral that we have gotten ourselves locked in to, and we need to get out. Management within individual organizations is faced with some direct, tangible problems that are attributable to the decline in productivity. The rising, indirect costs of doing business, as well as those associated with direct hourly compensation, continue to grow at a fantastic rate. We have a lack of adequate productivity measurement systems in most organizations; and when they exist, they rarely address themselves to management. They are focused on the work force, and they deal with the units of output per hour, per worker for the hourly work force. We fail to examine the productivity of those people who constitute the driving force in an organization, and who also cost the most. That is something that needs to be addressed.

There is a reduced rate of capital formation in this country. There are incentives to not save, and the correlation between productivity and capital formation is .9 (see figure 6). The rate of capital formation in Japan is four times what it is in the United States. It is 3.5 times higher in Germany than it is in the United States. These two countries' productivity growth exceeds ours by almost the same amount.

We have a tradition in this country of nonproductive labor/management relations. We operate on an adversarial model in our labor relations, and that is nonproductive behavior. We need to change that!

The question has been addressed to me several times this morning as I have visited with members of the staff is: "What is the attitude of labor, organized labor, to productivity? Don't they say that it is a bad thing because it means speed up, it means work harder, it means work longer hours?" My answer to that has to be, "No, that is not true." Organized labor has come to realize, at least some segments of that group have come to realize, that improved productivity in the United States is mandatory for their continued existence.

PRIVATE BUSINESS SECTOR

	1960-67	1967-77
Compensation Per Hour	4.9%	7.8%
Output Per Hour	3.7	1.6
Unit Labor Cost	1.1	6.1
Consumer Price Index	1.7	6.3
Real Hourly Compensation	3.2	1.5

FIGURE 4

Source: U.S. Bureau of Labor Statistics

THE LARGER THE PUBLIC SECTOR, THE SLOWER THE ECONOMIC GROWTH (1960-1975)

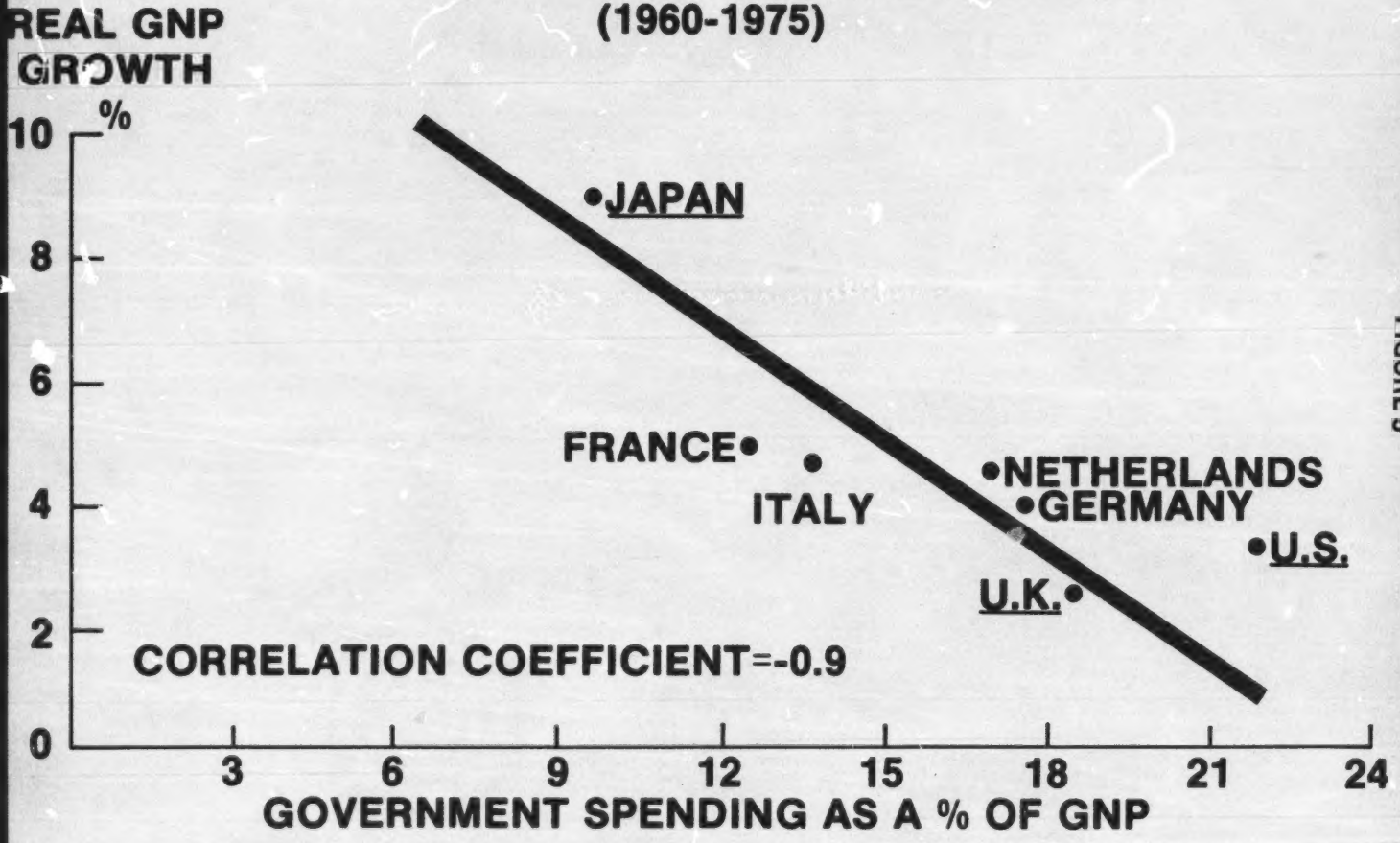


FIGURE 5

Federal, state, and local government expenditures for goods and services. Excludes transfer payments.

Investment Improves Productivity

1960-1977

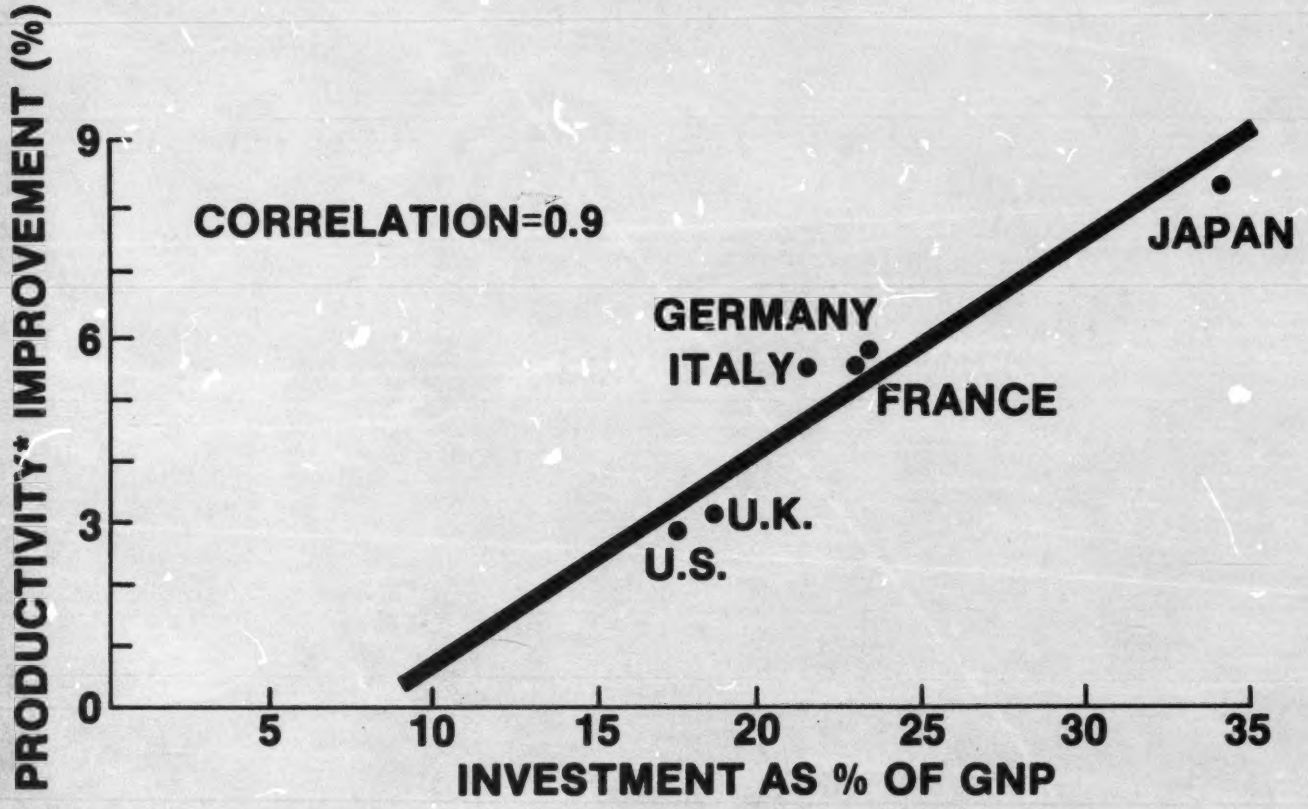


FIGURE 6

*Output per Man-hour in Manufacturing

When you talk to members of the steelworkers' union about productivity, their attitude now is much different from the way it was five years ago, but that has to do with the fact that we have lost 25 percent of our internal market in the steel industry to foreign competition. They have finally recognized that in order to survive as a union, they must become concerned about and participate cooperatively with steel industry management in productivity improvement efforts. The same is true in the mine workers' union. The same is true in the communication workers' union. The latter group of workers, in December of last year, convened a conference for members only in which the primary theme was that of productivity improvement. Although productivity growth in the telecommunications industry is among the greatest of all sectors in the economy, it needs to continue to improve if people in that industry are going to stay employed; and if they are going to stay employed, they are going to have to change. They are going to have to change their education; they are going to have to have different skills three years from now than they have today, or they will not have a job. The union called that meeting to say, "You've got to become more productive, or you're not going to have jobs. We, as the union, are not going to lie down in the road and block changes that are necessary in this industry. We are going to work with the organizations with which we are affiliated to help you make those transitions, but if you can't make those transitions, get out. It has to change, and you must be ready to go along with it."

When George Meany was still alive and president of the AFL-CIO, his attitude toward productivity could not be expressed in a forum such as this. The present president of the AFL-CIO, Mr. Lane Kirkland, has a much more positive attitude. He recognizes that productivity improvement is necessary, and, in fact, that labor should take the lead in productivity improvement. We are beginning to see some positive indications of that change in leadership attitude taking shape. I do not mean that if you were to walk into a local in a particular union and began to talk about productivity, the union members would not throw you out the door; but there are some positive changes beginning to occur at the top levels in various organizations. An example I might relate to you is that in a recent negotiation, the steelworkers included a clause in their contract that said, "We will establish a joint labor-management organization to address ourselves specifically to the improvement of productivity and quality of work life during the duration of this contract." This statement reflects a substantial change from their position of as little as a year ago. The reason for this change is rooted in those economic factors of which organized labor is painfully aware. Workers are getting less money now than they got several years ago in terms of real dollars. Unemployment is rising, and it is beginning to cut into membership, which is the lifeblood of the union. There is a reduction in the quality of work life in a number of sectors of the economy. This does not mean we are reverting to sweatshops by any stretch of the imagination. What it means is the employees perceive their organization as not as nice, not as good, not as pleasant a place to work as they would like it to be. Now whether that is real or imagined is unimportant; the fact remains that people perceive the quality of work life as having declined. It is a situation that must be addressed by any organization.

What is the reason for the decline in productivity in the United States? There are as many lists, such as the one that I will review with you in a moment, as there are people in the economic and business community. Most people have their pet sets of ideas, and with very little reading you will see that there is a tremendous amount of variation in the reasons given for the productivity decline. We do know some of the factors that have contributed to that decline. Here is a sample list.

Reduced Investment
Larger Service Sector
Government Regulations
Environmental Expenditures
Labor Restrictions
Work Disincentives

What we do not know is the percentage that each factor has contributed. If we cured the problem of the present labor force mix, what would happen to productivity? Would it go up? Would it go down? Would it go up one point, two? We do not know the percentage of contribution. There is some speculation. We have some historical numbers, but we do not have a firm grasp on the impact of these factors on productivity or productivity growth.

Let us review the list of reasons given for the decline in productivity. The composition of the work force, which is something that you need be very concerned with in your particular areas of endeavor, has changed since the end of World War II. About the time when productivity began to decline in the United States, we saw a tremendous influx of relatively inexperienced people into the work force. The "baby boom" began to hit the market, and we began to see more young workers entering the work force. We saw a return to the work force by women who had not worked before. We saw a greater influx of minorities. All of these groups came to the work force with little or no work experience. This had a negative impact on productivity. I am happy to say that recent studies indicate that among the members of these groups, learning has taken place. The inexperience factor is beginning to cancel itself out as people participate in the work environment over a period of time.

We ended the shift from agriculture to manufacturing in about 1967. We began a major shift from a manufacturing economy, beginning at the end of World War II and accelerating in the late sixties, to one that is service based. At the present time, the American industry mix is about 70/30; 70 percent service industry focused, and 30 percent manufacturing industry focused. The projection is that by 1985, we will be 90 percent service industry oriented. One of the problems associated with this shift is that we do not measure service industry productivity particularly well; therefore, productivity in the United States is probably better than the figures show. Another problem is that productivity in the service industries can never really reach the levels of manufacturing productivity or the levels of the manufacturing efficiency. I think that service industry productivity is a matter of management technique, of management talent. And that is a problem which can be addressed.

We have seen a reduction in investment. As I indicated, our current level of investment in this country, in capital equipment and facilities, is four times lower than it is in Japan, and 3.5 times lower than it is in Germany. Part of the reason for this low level is that there are no incentives for individual Americans to make the kinds of savings investments that are necessary for the capital stock of this country to expand. There is no incentive right now, or less incentive than there should be, for business to take that capital and expand it with new plants and equipment. There is an uncertainty associated with the economic behavior of the United States government that leads a business person to say, "Rather than commit to building a plant that will be ready three years from now, since I do not know what the economy is going to do, I am going to put those funds into some short-term investments rather than into new equipment." As a result, in the steel industry for example, there are twenty-two blast furnace establishments of "modern technology" that exist in the world, and only two of them are in the United States; fourteen of them are in Japan. Is it any wonder that the largest segment of the steel industry's lost market share has gone to the Japanese industries? No, not at all. This hesitancy on the part of the business community, and on the part of the investment community, is something that can be changed only by substantive changes at the national level. Change is necessary to create more stable economic policies than we have, and unfortunately, the problem is not being addressed as rapidly as it needs to be.

We have had a tremendous upsurge in what I will call "protective R&D" in various industries to comply with environmental and other regulations that we have imposed upon ourselves. I am not saying that those expenditures are not necessary for previous excesses to be redressed. I am in favor of clean water and clean air. However, I think in some cases we have exceeded what is necessary because of the way in which those regulations have been structured and enforced. We have diverted

attention from product development from R&D on new processes and products, to R&D that is associated with how to comply with regulations. If we look at the national productivity equation, or even at that of individual organizations, this R&D shows up in the input side and not on the output side of the equation. As a result, our measured productivity has declined in this country. That relates to another measurement issue, "How do you measure quality?", and that is something I will come back to later.

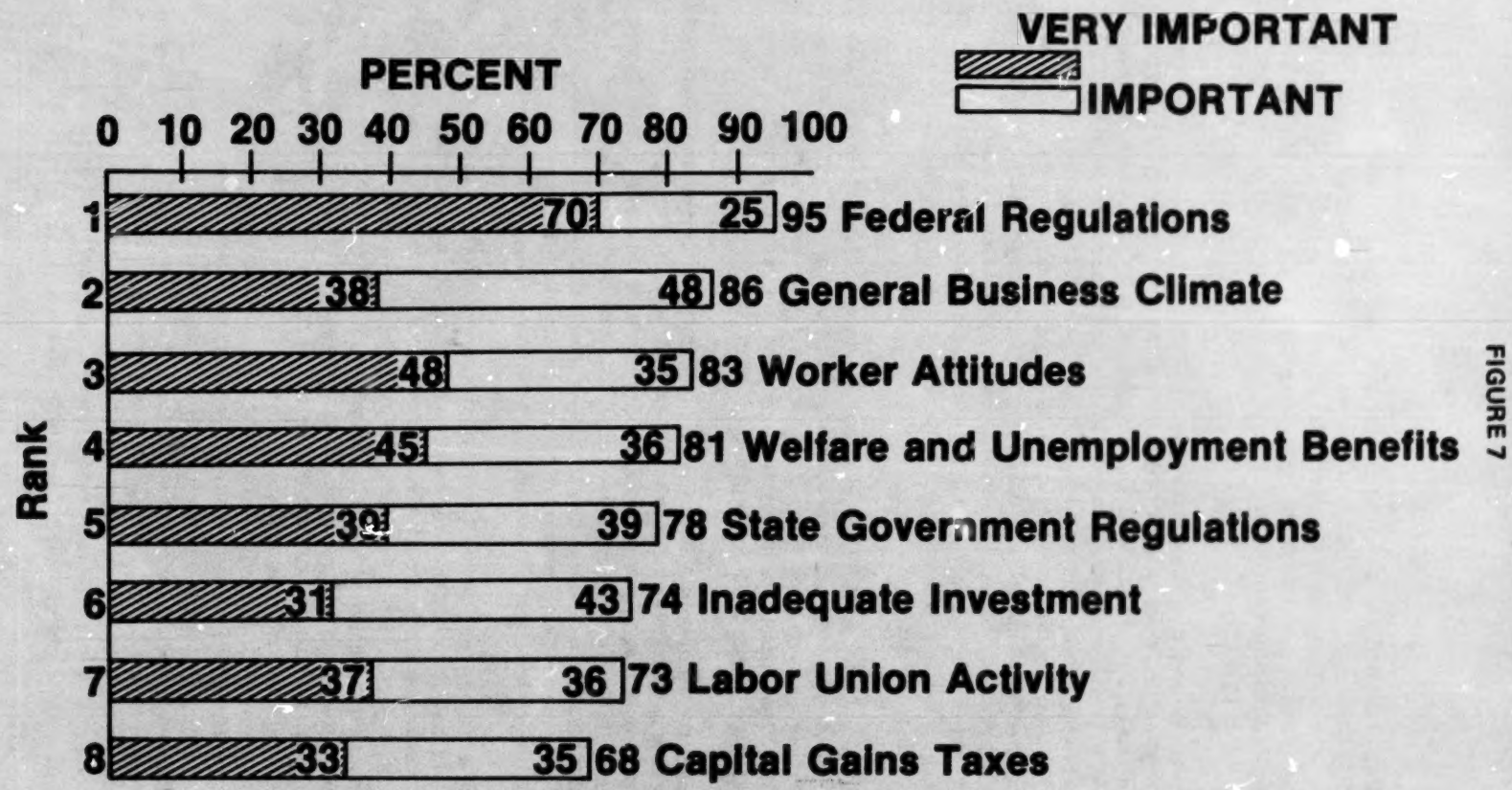
There has been a growth of disincentives to work in this country. Some of these are legal, in part the results of bargaining agreements imposed by unions, but the most difficult to change are those that have grown up out of habit. The idea of going home thirty minutes early to beat the rush hour, or coming in fifteen minutes late to avoid the rush hour are examples of such habits. These behavior patterns have appeared in reaction to management efforts to *get more work out.* They have resulted in some substantial cumulative changes in the work force's behavior, which have had a negative impact on the "work ethic." I talked to the general manager of a shipyard on the West Coast who indicated that on payday he had 135 more people in attendance than he did on any other day of the pay period, and that if he could only get those 135 people in there on a regular basis he could service two more ships a year, but he was unable to convince those people to come in on a regular basis on any day other than payday.

Included in figure 7 are causes for the business slowdown, as cited by the U.S. Chamber of Commerce in a survey of business leaders around the country. Some of these reasons are the same as those that have been generated by economists, but it is a much more exhaustive list. The general business community sees federal regulations as preeminent among reasons for the slowdown, the general business climate, the uncertainty, and *worker attitudes.*

Another recent survey of employees in Texas in which I participated indicated that the second ranking factor among workers' reasons for the decline in productivity in Texas organizations was *management's attitudes.* These opposite survey results reinforce the point I made earlier about our contentious pattern of labor/management behavior. The slowdown in productivity is related to this factor, and I think the pattern of labor/management relations needs to be changed. Other reasons cited in the U.S. Chamber of Commerce survey were welfare and unemployment benefits, state government regulations, the lack of investment, labor union activity, taxes, and inadequate R&D.

Management attitudes appeared at the end of this survey. Workers' skill level was also quite far down on the list, but I think it is also something that needs to be addressed. There is a perception on the part of the management that people entering the work force do not possess the requisite skills to do the job. Rightly or wrongly, that is the attitude of management in most corporations in this country. It does not reflect their attitude toward unskilled labor only. Not too long ago I met with management in the Internal Revenue Service to discuss productivity on the part of the Internal Revenue Service agents and officers responsible for audits and collection. This is not my favorite area for improving government productivity, but I have as my primary work assignment improving productivity in government organizations. One of the points I found interesting was that management in the Internal Revenue Service perceived degreed accountants and economists, who came into their employment after a minimum of four years of college training, as not possessing the basic skills required to audit taxes. In fact, it takes the Internal Revenue Service four months to train college graduates to the point that they will let them look at a tax return. They feel that these entry-level people do not possess the "right attitudes" toward the job, and these are degreed professionals. This example is only one of a number indicating that concern about workers' attitudes extends from lower skill levels of the work force to fairly high up.

CAUSES FOR SLOWDOWN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1 70 25 95 Federal Regulations
2 38 48 86 General Business Climate
3 48 35 83 Worker Attitudes
4 45 36 81 Welfare and Unemployment Benefits
5 39 39 78 State Government Regulations
6 31 43 74 Inadequate Investment
7 37 36 73 Labor Union Activity
8 33 35 68 Capital Gains Taxes

FIGURE 7

Source: Chamber-Gallup Survey of Business Confidence, August 1978

Productivity is perhaps best defined by enumerating what it is not: it is not speed-up. It is not profits. What it is, is a means to an end! Productivity really means more jobs, increased wages, improved profit for organizations, improved return on assets, and improved ability for an individual organization to compete in its sector of the economy, to compete nationally and internationally. It means an improved standard of living for American citizens, and it should also lead to an improved quality of work life.

For the first time in its twenty-year history, the Joint Economic Committee of Congress, in August of 1979, issued an unanimous report. It was signed by liberals and conservatives, Democrats and Republicans. The committee stated in that report and in its 1979 annual report, which was issued in January 1980, that "Productivity is the linchpin of economic progress in the next decade." The report went on to say that unless productivity in the United States improves in this decade, each and every one of us is going to suffer a decline in our standard of living. That decline is going to affect those at the lower end of the economic spectrum much more drastically, much more rapidly, than it is those of us who are more fortunate. I think that as a group of professionals concerned with the education of the work force in this country, the issue of productivity is something that you need to specifically address.

The Productivity Challenge

There are certain challenges that need to be considered in addressing productivity. The first of those is *political.* One of the reasons that there has not been a lot of activity is that specific attention to productivity has not been political in the United States. We as a nation have not answered the questions that are necessary about the behavioral and economic issues contributing to productivity's decline or improvement. So there are certain political changes that need to occur, and as a matter of fact, the whole concept of productivity has political overtones, even in the education business. If you are going to get involved in "improving productivity in education," you may find that it is very lonely out there. I do not think you are going to find a great deal of support just yet. It has not become good politics. I think that is going to change.

There is a challenge of *definition and measurement.* What is productivity? There is no universal definition of productivity. The definition of productivity, and how it is measured, is peculiar to the organization and to the functions being addressed. There is an elegant definition of productivity that says it is "output over input" (figure 8). The problem comes when trying to define output and input in a particular situation. Efforts at productivity improvement can be killed by continuing to persevere in attempts to define it. I would suggest that you take a certain amount of care in creating a definition. Try working with it, and if your definition does not actually describe what is taking place, then change it; but do not try to come up with an elegant definition.

I am particularly interested in the public sector. That is my primary area of responsibility. I can trace a history of documentation going back to about 1948 in the effort to define productivity in the public sector. What does it mean in local government? What does it mean in state government? There is no definition. As recently as last year, an article appeared in the *Journal of Public Administration* saying it cannot be defined. It has been defined. The definitions are not particularly elegant. Productivity has to do with how many tons of trash were collected per route mile. It has to do with number of shift hours in a police force per sector of patrol. It has to do with number of vehicle miles per shift. It has to do with number of water meters read per day. It has to do with number of students educated over a period of time. It has to do with the number of graduates who are placed in meaningful occupations by the end of three months or the end of six months.

FIGURE 8

$$\text{PRODUCTIVITY} = \frac{\text{OUTPUT}}{\text{INPUT}}$$

Productivity can be measured in the public sector. It can be measured in all sectors of the private sector as well. One of the reasons we have a problem defining and measuring productivity in organizations is due to the reluctance of people to submit to an examination of what they do. I contend that we could take any group that has similar functional responsibilities, let us say information services, and collectively we could define a reasonable set of measures for the information services group before the end of this afternoon. Not only could we define those measures, but if that group constituting information services would agree to be measured with those particular measures, we could begin to collect data starting tomorrow morning. I will leave it to you as to why those measures are not in place at the present time.

As I said, there is a fairly elegant definition for productivity. All you have to do is figure out the specific terms for the bottom and the top of the equation. I happen to prefer the following definition. It is much more meaningful for me, and perhaps it would be for you: "Getting more out of what you put in." Regardless of what it is that your organization consumes, improving productivity is achieving greater benefits from that process.

In terms of how an organization should approach the problem of productivity definition and productivity measurement, at minimum an organization must use the partial measures in figure 9 to assess its productivity. Focusing on any one of the factors to the exclusion of the others results in a distorted perspective on the productivity of the organizational entity, at any level, including the nation as a whole. For example, the United States, as indicated earlier, defines productivity at the national level strictly in terms of output per person-hour. That is a labor-partial measure; it does not take into account the contribution of capital, materials, or energy. Therefore, we have a distorted picture of productivity in the United States, and unfortunately it is distorted upward, because if you look at output of capital and energy in the United States, our productivity growth rate is even lower than that which I described earlier.

The weight that is given to each of these factors in figure 9 or to any other set of factors that describes an organization will vary considerably. For example, it would probably be inappropriate to try to assess the productivity of this organization in terms of output per amount of energy consumed because are not particularly an energy-intensive organization. I think that it is necessary to look at energy productivity in any organization, but I would suggest that the weighting for labor and capital be much higher in this organization than for energy. Similarly, I expect your materials consumption would be fairly low, except for print shop operations or something like that. The set of partial measures that describes an organization can be as small as the four I have indicated. It can also be quite extensive. In this respect I would use the example of United Airlines trying to assess the productivity of its operations throughout the United States. At the present time, there is no single number that describes the productivity of United Airlines because the management of the airline made the conscious decision that any single number would be inappropriate. They use a set of eighteen measures that describe various functional aspects of the organization. They collect data on those measures at each of their operating locations, and they directly compare the performance of aircraft utilization over time—for example, between Chicago and San Francisco. They compare the performance of ticket operations in Los Angeles to those in Chicago and San Francisco, but they do not try to compare ticket operations to aircraft utilization. There is no reason to do so. It would not mean anything. In the case of United Airlines, or a similarly diverse operation, there may be as many as eighteen or twenty measurements to describe the organization and provide an accurate picture to management of the operating effectiveness and efficiency of the various operations. Such a system allows them to make the kinds of trade-offs that are necessary to run a complex organization.

In some cases, if all of these partials are converted to a common language (the only one we have been able to discover is dollars), they can be pulled together into a single composite measure. They

PRODUCTIVITY IS

$$\frac{\text{OUTPUT}}{\text{LABOR}}$$

$$\frac{\text{OUTPUT}}{\text{CAPITAL}}$$

$$\boxed{\frac{\text{OUTPUT}}{\text{INPUT}}}$$

$$\frac{\text{OUTPUT}}{\text{MATERIALS}}$$

$$\frac{\text{OUTPUT}}{\text{ENERGY}}$$

FIGURE 9

can be aggregated into something called by Dr. John Kendrick, an economist at George Washington University, "total-factor productivity." I refer to it as "multifactor productivity," because there is always an unexplained residual at the tail end. This particular measurement structure is one that Dr. Kendrick has championed for forty years, but it is one that the American economy has refused to accept. Dr. Kendrick, who we are fortunate to have on the board of directors of our organization, has recently completed a study in which he has plotted the total-factor productivity for the United States since the end of World War II. Those data do nothing to make me happy. They reinforce part of the statement I made earlier today about the gloomy situation we find ourselves in as a nation.

The *third challenge* is one of planning. We do not plan for productivity at the national level or at the organizational level. Productivity is not typically a goal that an organization strives to achieve. This is a mistake. It needs to become a conscious goal that we strive for, for instance, to increase productivity by 3 percent or 5 percent this year; to increase productivity in operation X by such and such a percentage. People and organizations are goal-directed entities to the extent that if they know what the goals are, they can try to achieve them. We have failed to do that. We have failed to address ourselves to productivity as a part of our national planning, or to organizational planning in general.

The last and perhaps most important challenge facing productivity is *behavioral.* How do you answer the basic question that I am sure several people have already asked themselves. That question is—"What is in it for me? Why should I become more productive? What gains accrue to me as an individual, as a wage earner?" Unless an organization, unless a nation, can begin to answer that question, then productivity is not going to improve. The particular motivation techniques, the particular ways in which a commitment to improving productivity are developed, are, again, peculiar to the organization, its function, and the composition of its work force. One of the factors that influences the selection of a particular approach has to do with the value systems of the employees. Establishing productivity as a goal in the value systems of individuals requires that they internalize the notion that productivity improvement is part of the reason they are working. This requires changing the training and education of the work force, both the entry level work force, and those with experience, to emphasize that they should be doing as productive a job as possible. They should be getting more out of whatever they put into a job. I do not think we do that very well.

Most economic theorists would concur that improvement in the economic well-being of a country or any other organizational entity is keyed to the growth of productivity in that organization. Public opinion polls that have been conducted over the last several years show, on the other hand, that the majority of the work force in the United States thinks that the benefits that accrue from improving productivity go to the stockholders and the management in private sector organizations and do not mean benefits to individual employees. We need to resolve this misunderstanding. Part of the dilemma is related to people's attitudes toward their work, which have declined over the years. People believe that work is not as satisfying as it once was, that the environment in which they work is not as good as it could be, and that their chances for promotion are not as good as they could be. The only attitudes that have changed positively over the period covered by these surveys are attitudes toward coworkers, and employees' ability to work together. That says to me that we have failed, in managing and operating organizations, to relate effectively to our work force. Employees do not perceive that they benefit from improved productivity. I would contend that their perception is incorrect, but that is what they believe. Therefore, it is up to us as managers, it is up to us as educators, to show employees that they have an erroneous perception. We must demonstrate conclusively to them that their perception is wrong, and get them to adopt the definition that I gave you earlier: productivity is getting more out of what you put in.

An Approach to Productivity Improvement

How do you cause productivity to improve? Nobody that I know has any magic answer to that question. What we do know is that there is a variety of tools and techniques which, when applied properly and matched to the requirements of specific organizations, has resulted in improved productivity. I can talk to you in detail about what has happened in the Exxon Corporation, Boise Cascade, Coors Container Company, and Donally Mirror Company regarding the improvements that have occurred in productivity when particular tools have been applied. Will those tools work in the organizations of which you are aware? Will they work here? I do not know. That decision needs to be made on a local basis. What I think researchers such as yourselves need to do is to become more aware of the productivity improvement tools that are available, how they might apply within this organization specifically, and how some of those tools might be translated into practices in vocational education.

Let us talk about where productivity improvement comes from. There was a study done by Edward Denison of the Brookings Institution in 1974 (Denison 1974). He studied the historical sources of productivity and growth in the United States economy from the end of World War II through about 1970. The largest percentage, about 48 percent, is attributable to technological innovation. Increases in the average level of education account for about 12 percent. Better utilization of resources, including better utilization of human resources, accounts for another 12 percent. Economies of scale account for 16 percent. The application of capital accounts for about 16 percent. That study has been subjected to a certain amount of criticism, as underestimating the impact of education. I would submit that this is probably true, because it did not take into account the contributions of education in the generation of the technological innovations that make up the largest percentage section. I am not sure that we can assess that. The point I make when I talk to industry audiences and public sector audiences about those historical sources of productivity improvement is that in a typical organization, the lead time for selecting and putting into place a technological improvement is fairly substantial. In a private company it is often a year. In the federal government any substantial technological innovation, such as a new truck, takes three years, computers take seven, and new buildings take nine. Before the benefits of technological innovations in an organization can be realized, the present technology must be tolerated and used productively for quite a while. An available resource, and one that can and needs to be tapped quickly, is the human resource, human assets within the organization. Employees' education and effective application of learning combine to form approximately 24 percent of the available sources of productivity improvement, and they can be tapped as quickly as this afternoon. One of the most important actions that any organization can take to improve its productivity is to urge its employees, and by employees I mean everybody from the janitor to the chairperson of the board, to become involved in the process of productivity improvement. This works very well. The results have been substantial and are well documented. It is part of the responsibility of an organization such as the National Center for Research in Vocational Education to tap into that potential.

Improvement of productivity in any organization requires a structured productivity program. I would like to share the one favored by the Center with you. This program has ten elements. The weight given to each of these factors will differ significantly from organization to organization, but a successful program has at least these ten elements:

1. Awareness and acceptance
2. Organization
3. Goals
4. Resource Effectiveness
5. Employee Involvement

6. Incentives and Gain Sharing
7. Rewards and Recognition
8. Training
9. Measurement
10. Leadership

The first element is *awareness* that productivity needs to be improved, needs to be accepted, by all levels in the organization, particularly top management. They need to recognize the problem and be ready to deal with it. The particular approach to improvement selected by the organization must be keyed to the *structure* and the *goals* of the organization. It must be part of the way business is done on a daily basis; to the extent that this is not done, the program will fail.

It must be keyed to using the *resources* that the organization has available, whether these resources are people, capital, or energy. The approach should maximize the potential of the resources that the organization uses. It should *involve the employees* from the beginning of the productivity improvement process. It should not delegate the responsibility for the decisions to the employees, but it should involve them in the planning. The approach should deliberately have employees participate in making decisions about their economic well-being, the way they do their work, and the kinds of work they do. This includes the involvement of labor organizations as well as individual employees. There should be a structure, a way of answering the question of "What is in it for me?" There must be some *incentives* for being more productive. There should be a mechanism for sharing the gains that accrue to the organization for more productive behavior. If you cannot answer the question, "What is in it for me?", at the beginning of a program you may get some cooperation anyway, just because the effort is new and different. Six months later, if your people still cannot answer the question, "Why have I been doing this? What is in it for me?", productivity may quickly revert to what it was. There needs to be a structure for *rewarding and recognizing* the efforts of people in the organization. There needs to be a structure for providing the kinds of feedback that we all vitally need: whether we are doing a good job, a bad job, or no job at all. The particular approach for productivity improvement needs to become integrated into the *training* systems that support the organization. Productivity needs to be a conscious part of that training. People need to have explained to them what constitutes productive and nonproductive behavior, in terms of their own jobs.

Management, itself, needs to know what productive behavior is for its jobs. One of the most serious deficiencies in productivity improvement in industry is with supervision. High technical qualification in a supervisor does not necessarily make a good supervisor. That management appointment approach has historically failed, but we continue to use it. These people are often not equipped with the tools they need for their new responsibilities. Nobody has ever explained to them what productive supervisory behavior is, as opposed to productive technical behavior.

There needs to be a *measurement* structure. If we do not know where we are, if we do not know where we have been, we will never find out where we are going! There is a basic communications model that says there has to be feedback for true communication to exist. The organization needs to be able to know where it has been, where it is going, whether it has done well, or whether it has done poorly. There also needs to be *leadership* to install the program and to keep the program going once it is installed.

Let me present some empirical data to support this program model. Some of these elements are more strongly supported than others, but it is a combination of these ten elements that we have found in place in organizations that are productive. I have enough data that say that those ten elements, at a minimum, must occur, because when those elements are missing, the programs fail.

QUESTIONS AND ANSWERS

Question: What has business' contribution been to the decline in productivity as opposed to government's?

Business is responsible for the decline in productivity. There is absolutely no doubt about that. It is the action agent, if you will, that causes productivity to improve or not to improve. There is a failure on the part of business management and business organizations as opposed to workers' groups, for example, to cause the kinds of structural changes in their organizations, the kinds of behavior modifications, that would lead to improved productivity. There is absolutely no doubt about it. The list of factors contributing to the decline in productivity in this nation that I gave you was not intended to be exhaustive. It was intended to be illustrative. I indicated that I had reservations about the contribution of each of those factors. Poor management in organizations is probably the major contributing factor to the lack of productivity. I would not argue that for a moment. The argument has been advanced on occasion that productivity and management are synonymous. I would argue that good management and productive behavior are synonymous, and unfortunately, there is a dearth of good management in this country and in other countries.

Question: Do you have any observations on what accounts for the decline in productivity due to the lack of good management?

There are specific examples I might draw your attention to that indicate the kinds of deficiencies we find (Hayes and Abernathy 1980). In the public transit field, for example, historically there was not enough hiring, in the late fifties and early sixties, of college graduates into management positions in public transit organizations throughout the United States. That has translated today into a lack of a professional managers pool in the public transit business. That is correlated with the poor performance of public transit organizations—railroads, busses, and the like—throughout this country. You will find in most transit organizations that the people in senior management positions are well along in years, and have been in the transit business for many years. Mid-level management positions are typically filled by people who have two or three years of experience in the transit business. In this instance, there was a lack of recognition of the need for succession fifteen to twenty years ago, and a failure to bring people into the business.

In the construction industry, in the building of large power plants, for example, statistics show that average workers put about three out of eight hours per day into work where they have their hands on their tools. The second largest chunk of their day, almost 30 percent of the time, is spent standing around waiting for materials or supervision (Bahrke 1980). That is not the workers' fault, that is poor planning, that is poor supervision. We have failed to train those construction managers in planning, work flow, and other factors relative to work output. We have failed to give them sufficient information to get materials in place in time, and we have forgotten to train first-line supervisors on how to handle workers to make sure that they put them on the job. I could go on and on with more stories of the kinds of deficiencies that exist. Are they conscious deficiencies? Were they deliberate? No, I do not think so, but they exist and steps need to be taken to cure them.

Question: Would you modify this presentation if you were addressing a different kind of audience, such as union workers?

I have had absolutely no problem in making this same presentation to members of the United Mine Workers, to hourly employees in shipyards, to garbage collectors, and to dog catchers. Did they always agree with what I say? No, but do I bend my message to fit the audience? Absolutely not!

Question: In a nonformal labor/management situation, such as that represented by a school district, what can be done to reduce nonproductive labor/management relations, for example, between school administration and teachers?

The responsibility would have to lie with both sides. It would have to come from a recognition by "management," and I am not sure where that dividing line is between management in education or research, and the people who constitute "labor."

On the employees' side, there has to be an assumption of responsibility for the quality and quantity of work and a willingness to assume responsibility for how that work is accomplished. On the management side, there has to be a recognition that the employee is probably the expert with respect to that job, whatever it is. I would contend that somebody who has put in fifteen years in a classroom or fifteen years as a welder knows more about that particular job than the principal or the supervisor. That expertise needs to be recognized and solicited. My boss, Dr. Grayson, makes the observation that the cheapest set of consultants any organization can hire is already on the payroll. That is, if you can tap the pool of resources already existing in your organization, you will be that much further ahead.

There is a set of work improvement and productivity improvement techniques that deal with employee involvement. These techniques call for the conscious delegation of responsibility for the work that is done and the quality of that work to the lowest possible level. They also delegate to the lowest possible level the responsibility for suggesting (notice the word suggesting) and recommending changes in procedures, processes, and tools. None of those techniques removes the responsibility from management to make necessary decisions, but they actively recruit and pass the responsibility for the generation of those suggestions, those changes, to the people who do the work. I would suggest that, to the extent that this kind of a model can be put into place in the situation you are talking about, the us/them relationship could change.

Question: What is your definition of experience?

The operational definition of experience to which I am referring, the one that I use, is time on the job, that particular job. Recognizing that an individual can make the same mistake one hundred times, the studies that I am aware of regarding the best predictors of competency on a job, the best predictors of safety on a job, have to do with time performing that function—with time in that job. For example, if you look at the accident statistics in the mining industry, the best predictor of whether or not an accident will happen is not just experience, but experience in a particular situation. Time in the mine has absolutely no relevance. The individual could have twenty years in the mining industry; whether or not an accident will occur has more to do with how long that worker has been running that particular piece of equipment. That is the operational definition of experience that I use.

Question: Would you expand that definition with respect to your comment that less experienced persons are entering the work force?

I think the same definition is reasonable in that particular situation. People have been coming into the work force and assuming new functional responsibilities that they had not had before. I do not care if an individual is eighteen, straight out of high school, or forty-four, coming from a homemaker's position into a factory position or a technical position; the individual has not fulfilled that function before. Therefore, that person is less experienced than some individual who has been in that position for four years. That is the way in which I was using the term experience.

Question: During the time period over which productivity has declined, was there a conscious decision by management to utilize labor because of its lower cost—lower cost being associated with the influx of less experienced people into the work force—than to rely on capital expenditures or more productive technology?

Although less experienced people are, in fact, less expensive to use, I am not sure that the reduction in capital investment tracks exactly with the influx of that cheaper labor. The causes underlying management's reluctance to use, or to acquire for use, capital in the large amount that is necessary to effect improvements in an organization's productivity have probably been due less to the availability of "cheaper" labor than they have been to the operation of the following factors:

- Fear—of what the future will bring in terms of market conditions, economic policies, interest rates, and other factors
- Uncertainty—with regard to the correctness of a proposed course of action in light of all the factors listed previously
- Doubt—with regard to the company's position, the mvoes of the competition, and any new federal regulations

Contrary to conventional wisdom, the introduction of capital-financed productivity improvements in technology, tools, or physical plants does not reduce employment. Productivity in this country has improved five-fold in the past century, and employment, both numerically and percentagewise, has improved as well. The productivity of the Japanese auto industry is frequently cited as one of the reasons for Detroit's current problems. What is not acknowledged is that the significant improvements in the productivity of Japan's auto industry have been accomplished by a 50 percent increase in employment.

Question: American agriculture is thought of as being the most productive in the world. Is there any positive transfer that can be made from agriculture to other sectors of the economy?

Let me puncture a hole in your balloon. Productivity in agriculture in the United States is not as high as we have been led to believe. Relative to other segments of the economy, the agricultural industry ranks about seventh or eighth in terms of productivity. We are, in terms of production, not productivity but production, the most productive agricultural nation in the world. There is absolutely no doubt about that. However, in terms of productivity per unit of ground, or productivity of capital in agriculture, we rank fairly far down on the list in terms of countries such as Japan and some of the more developed nations of Europe who produce considerably more per acre of ground than we do. United States' productivity in agriculture increased about twice as fast as productivity in nonfarm sectors of the economy in the first sixty years of this century. Since that time, it has declined at a

rate parallel to that of the economy as a whole. Our productivity or production in agriculture comes at the cost of tremendous infusions of energy and capital. I think that we have a long way to go in agriculture with respect to improving productivity, even though the industry is healthy. I am not exactly adverse to the idea of taking some people from that industry and transferring them into some of the more poorly managed industries that we have.

Question: When an industry decides to measure gross productivity of its efforts, how does quality enter into the equation?

When you talk about gross statistical measurements of an industry, you must make the assumption that quality is equal. Now, I recognize that is an erroneous assumption when you are talking in gross numbers about the performance of nations. Is the standard of living in the United States the same as in Japan, or the same as it is in France? Are we willing to trade that standard of living for better productivity? That is an individual decision. We make the assumption, when we talk at the global level, that quality is equal, and that is a measurement error, if you will. When you are talking about an individual organization, you must measure quality at the same time as you measure quantity of output. If you do not have a quality measure, then you are misleading yourself. The question of what constitutes "quality" in education, and measures thereof, is one that has vexed education for decades, and is more properly the domain of educational professionals rather than me. In the area of vocational education, however, I would be willing to venture that the competition to hire graduates of a program would be a measure of the quality of that program. To be sure, that is a subjective measure, but it is one that reflects a value-added approach, which is important.

Question: How do you measure productivity in an organization that is composed of people who work primarily with information—people who are, for want of a better term, knowledge workers, professional and technical people who produce a product over which they have no direct control in terms of application of that product, or in terms of profit and loss associated with that organization?

In direct terms, I expect that there would be some exception taken to the point of profit or loss for an organization working primarily with information. If nothing else, you would be trying to operate at zero profit, but certainly not at a negative profit or a loss. You would in fact have deadlines. You would in fact have deliverable products. Input and output can be measured in professional organizations, and they can be tied together very directly. Performance of this sort can be assessed. The question of whether it *needs* to be measured is another point entirely. It may be that the measurement of performance in an individual work group can be subsumed under a larger measure of performance, and that is the appropriate level at which to measure performance in an organization.

I do not feel that it is necessary for an organization to measure the productivity of an individual. The management of any entity needs at least two sets of measures for two sets of reasons. It needs to know about the performance of individuals to decide whether to retain them, to dismiss them, to give them a raise, or to transfer them. That is one set of assessments that is used. Management also needs to know about the productivity of the organization itself and its major components. That can be measured in tangible dollars-and-cents terms. In terms of productivity measures for the organization, trade-offs about resource allocation can be made. It is a separate set of measurements, used for a separate set of reasons.

Question: What specific research and development activities should be engaged in that will have an impact on policymakers (i.e., the Congress), that will result in vocational education contributing to an increase in productivity across the nation?

It is not the lack of R&D activity that has prevented us from having an impact on policymakers, it is the lack of R&D results, expressed in meaningful terms, that has prevented that impact from occurring. Educational R&D (like that in a number of other fields) has not led to successful policies or programs. Instead, it has often been planned and implemented in isolation from the decision-making process, and has produced little information of interest and utility to policymakers. R&D activities are sometimes designed to build professional reputations, advance careers, or maintain institutional visibility, rather than to address the hard questions.

Research and development activities that will have an impact on policymakers (whether in Congress or at other levels in the federal and state governments) would be extremely difficult to pinpoint with real accuracy. However, I think it would be reasonable to state that, given the present concern for productivity and the interest in helping our various industries become more productive, any R&D results that can demonstrate a strong link between educational expenditures and the productivity of a group (e.g., graduates of the xyz program hold more jobs and earn higher pay than nongraduates), an organization (e.g., graduates of this program that have been palced with company A have demonstrated better attendance, higher achievement of bonuses, and more promotions than individuals who did not have this training), or an industry (a longitudinal study of the industry indicates that the vocational program has produced the following results) would be of substantial interest at the policymaking level.

Question: How can productivity be improved in local and state vocational education programs?

This question is somewhat difficult to answer from two standpoints: the first is that I am not an expert in vocational education; the second is that it would be naive and pretentious for met to attempt to prescribe for the needs of this nation's entire vocational education program. However, I think that there is something that can be learned from the productivity-related research and experience that has been garnered from other sectors of our economy.

First, let us examine the tangible results that have been achieved by organizations that have directly addressed their own productivity. These results have included the following:

- Reduced production costs with increased pay rates
- Improved output per employee over time
- Substantial reductions in overhead costs
- Reduced labor costs
- Improved quality/quantity of service
- Reduced absenteeism
- Reduced numbers of grievances
- Reduced employee turnover

To the extent that state and local vocational education programs are able to produce individuals who can join organizations and contribute to the achievement of these kinds of results, I would have to say that these programs are successful.

How do we make that happen? Again, I think that there are some lessons to be learned from the work on productivity that has been accomplished to date. I would make the following points:

- The pace of technical progress in any industry stems largely from the degree of effective diffusion of the best practices—the most productive practices. The existing variations in levels of productivity between individual organizations/plants in any industry or geographical area are due in some part to the lack of diffusion of best practices between organizations/plants. To the extent that vocational education programs contribute to the effective diffusion of "best" practices, to the extent that they provide people with the skills that contribute to the adaption of new techniques/technologies, then they can be considered productive.
- The effect on jobs of productivity boosting technology interacts with geographical shifts in production. This has happened before in this country, and it will continue to happen. An expanding industry can absorb the kinds of technical change that lead to fewer jobs per unit of output without shedding workers. In that situation, the emphasis of the vocational education programs needs to focus on preparing people to assume varied job responsibilities, to be flexible. But if the industry is one that is squeezed by the arrival of new producers, technological change often erodes employment. Vocational education's role then becomes one of helping to accommodate those technological changes and to prepare individuals for tomorrow's growth industries.

Question: Federal legislation mandates that each state evaluate local vocational education programs every five years. The two measures, stated by federal legislation, on which programs must be evaluated are placement in jobs related to training and employer satisfaction. Would you suggest other factors that would measure the productivity of these programs and specify how research could facilitate this measurement?

As with the performance of any organization/program, the examination of the productivity of vocational education programs would require looking at both efficiency and effectiveness. Efficiency —"doing things right"—and effectiveness—"doing the right thing"—can both be examined, but they must be examined in terms of proxies or surrogates for the real outcomes of a vocational education program.

The ultimate aim of any vocational program is to improve the well-being of those who have been involved in the program. While a laudable aim, it is not something that can be accurately assessed. Thus, we are limited to examining surrogates for that well-being. As I stated in my presentation, productivity is defined as output/input; I went further and said that a "set" or "family" of measures is often needed to adequately describe the performance of an organization. The same is true of a vocational education program.

I would say that, as a minimum, any vocational education effort should be assessed in terms of the following:

- Operational efficiency
- Program efficiency
- Operational cost effectiveness
- Program cost effectiveness

The efficiency measures would be indications of the productivity of the internal operations of the program. The effectiveness measures would measure the degree to which the program was succeeding in meeting preestablished goals, and the costs of achieving those goals.

Question: Would you describe the productivity tools you mentioned in your presentation that researchers should learn about for potential application in vocational education?

The "productivity tools" that I made reference to fall into two categories: the first of these is with respect to, what I detected to be, a certain amount of concern for productivity improvement here in this organization, or in the organizations from which people in the audience come; the second category was with respect to the application of information about productivity and productivity improvement in the context of vocational education and vocational education research.

With respect to the first category—productivity improvement in this organization or other organizations that employ professionals of the calibre that are developed here—productivity improvement in such organizations is complicated by the difficulty associated with the development of useful measures of productivity. That is not to say that measures cannot be developed, just that it is more difficult to do so than it would be for a manufacturing organization. The measurement tools, the assessment tools, and the tools and techniques that could be used to increase productivity all exist. What appears to be lacking is the motivation and the leadership to examine critically what it is we do as researchers and as professionals, and to ask the important questions about the value and productivity of those efforts.

In the second area—the productivity of vocational education and vocational education research's contribution to that productivity—I think that it is a matter of not having rigorously examined the impact of our efforts. The cause and effect relationships between existing vocational education programs and the productivity (or lack of it) of their graduates have not been explicitly examined. Perhaps it is my lack of familiarity with the field, but I am not aware of any series of studies that can empirically demonstrate an improvement in individual, organizational, or industry productivity as a result of the existence of a particular vocational education program.

The evidence would seem to indicate that, despite the large increases in expenditures for education and the increased numbers of relatively educated workers (e.g., those with high school degrees and some exposure to higher education), productivity at the national level, and in most sectors of our economy, continues to decline. While either side of this argument could be debated with equal fervor, I think you would agree that there is a disappointing lack of information regarding the effectiveness and efficiency of vocational education programs. Again, I do not believe that the reason for this is the lack of tools. Evaluation techniques and research methods are an integral part of the training each of you is receiving. What appears to be missing is the commitment, the incentive, to critically examine and document our failures and our successes.

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